

PRIMARY CALCULATOR

Activity Book



**Problem
solving using
four-function
calculators**

Topics include:

- Patterns
- Measurements
- Number Sense
- Data & Chance





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Primary Calculator Activity Book

Problem Solving Using
Four-Function Calculators

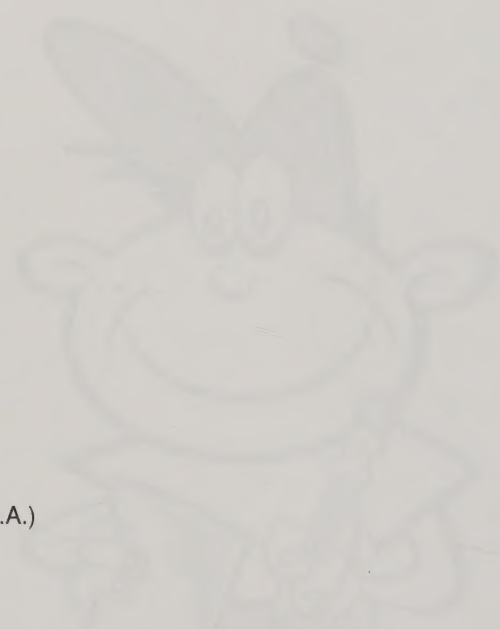


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GRADES K-3

Primary Calculator Activity Book

Problem Solving Using
Four-Function Calculators



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GRADE 4-5

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Introduction

The *Primary Calculator Activity Book* contains more than 30 problem-solving tasks for children in grades K through 3. These tasks challenge children to explore and solve problems in four key mathematical areas:

- Number Sense
- Patterns
- Data and Chance
- Measurement

This resource book supplements your mathematics program and can be used in regular, special education, and remedial classrooms. The mathematical topics and the spirit of the problem-solving tasks are consistent with recommendations of the National Council of Teachers of Mathematics (NCTM). The problem-solving tasks incorporate:

- Estimation
- Mathematical reasoning
- Natural connections for using the Primary Calculator, Basic Calc-U-View® calculator or other four-function calculators
- Written and oral communication

Unless otherwise suggested, it is recommended that children work collaboratively with a partner as they engage in the activities of this book. An opening question sets the stage for each activity, inviting students to predict or estimate the outcome of a problem task. The activities engage students in completing tasks which utilize a calculator as a natural tool and invite children to communicate their results in writing or by orally sharing their ideas. Children are often asked to reflect on their original predictions or estimations and to compare these with actual outcomes. Sharing and discussion helps children solidify understandings and find new applications for the ideas presented.

The problem-solving activities in this book follow a flexible format with the following features:



Work Together: Children explore and complete a problem task while working together with a partner.



Write About It: Children record their thinking or explain their solution approach in a math journal or notebook. Students can also write about their math experiences on the back of the activity sheets. Students can keep their math journal pages in a binder.



Talk About It: Children share their ideas with others in the class.



What If? Sometimes children are asked to think through special puzzles.



A Step Beyond: From time to time, children are challenged to extend their thinking about a problem task.

On some pages, students are reminded of Activity Masters and special materials needed to carry out an activity. Before beginning an activity, check the bottom of the page for the following icon:



YOU'LL NEED:

It is assumed that all activities require a calculator, paper, and pencil.

Teaching Notes are provided at the beginning of each of the four sections. These include an overview of the section as well as teaching suggestions for each activity.

USING CALCULATORS:

There are a wide variety of four-function calculators readily available today. In addition to the common $+$ $-$ $\times$ $\div$ $=$ keys, the following features are common to most:



On/Clear: Turns the calculator on and then clears the display, constant (if any), and arithmetic operation currently stored in the calculator.



Clear/Clear Entry: Some calculators combine the C and CE functions on one key. Press once to perform "Clear Entry." Press twice consecutively to perform "Clear."



Clear Entry: Clears the display only.



All Clear: Some calculators also have this key, which clears the display, the memory, any constant, and any arithmetic operation.



Add to Memory: Adds the number currently on the display to the memory. The memory is cumulative.



Subtract from Memory: Subtracts the number on the display from the number in memory.



Memory Recall/Memory Clear: Press once to recall to the display window the number in memory. Press twice to clear information in memory.

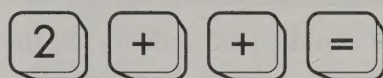
Section I : Patterns

OVERVIEW

A variety of number patterns and relationships are explored in this section. Students engage in tasks that require them to recognize, describe, and extend patterns, as well as make predictions based on their interpretations and analysis of patterns. In many activities, the calculator functions as a tool for generating counting patterns.

TEACHING NOTES

What's the Pattern? Students use the calculator to explore skip counting patterns. This activity is one of many that utilize the calculator's constant function. While most four-function calculators will have a constant function, the keystrokes given for this activity might not apply to all calculators. Some calculators require the following keystrokes:



Refer to the section on constant functions in your calculator's manual for specific details. On the Learning Resources® Primary Calculator, the keystrokes for the constant function are the following:

Function	Example	Press/Enter	Display
Addition +	$3 + 2$	3 $\boxed{+}$ 2 $\boxed{=}$	5
	$6 + 2$	6 $\boxed{=}$	8
	$12 + 2$	12 $\boxed{=}$	14
	(+ 2 is a constant)		

See the Calculator's manual for more information on constants.

What's Next? The calculator's constant function is used to examine the concepts of "one more" and "one fewer" when counting on or counting back from a given number.

Eyes Closed, Eyes Open: In this partner game, students use the calculator to check as they mentally count on or count back from a given number.

100 Chart: Students use the calculator to skip count by 2, recording different counting patterns on the 100 Chart. They also write a brief description of each pattern. Instead of placing counters on the 100 Chart as suggested in the activity, patterns can be colored directly onto the chart. Concepts of odd and even should emerge as students compare and contrast the different patterns they generate.

Chart Patterns: In this activity, students examine a sequence or block of numbers on the 100 Chart to find patterns in the sums of selected numbers. For example, in any line of three numbers, the middle number is one-half the sum of the other two numbers. Have students calculate the diagonal sums to see that they are equal. Have students add the digits that make up numbers in columns. Ask them to identify the patterns they see. Students will identify various other patterns as they examine 3×3 and 4×4 blocks of numbers. Ask them why these patterns work. A 200 Chart has been included to encourage the exploration of three-digit numbers.

Guess My Rule $\oplus$ $\ominus$: In this activity, one student uses the constant function in secret to enter a counting on or counting back rule into the calculator. Another student must identify the counting pattern to guess the rule. For students who require greater structure, provide recording sheets like the following:

Game 1		Game 2		Game 3	
Enter	Display	Enter	Display	Enter	Display
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
Rule: _____		Rule: _____		Rule: _____	

Odd or Even? Concepts of odd and even are explored as students use the calculator to test their conjectures about the sums and differences of odd and even numbers.

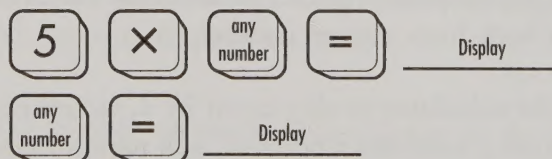
My Turn, Your Turn $\oplus$ $\ominus$: Students continue to explore odd and even numbers. This activity features a fun way of randomly selecting a number on the calculator—with eyes closed, randomly punching one or more digit keys.

Evens vs. Odds: This time, students examine the effects of multiplication on odd and even numbers. The Talk About It section of the activity will allow you to assess students' intuitive understandings of these concepts.

My Turn, Your Turn $\otimes$: Students continue to explore odd and even numbers using multiplication.

Guess My Rule $\otimes$ $\div$: The operations of multiplication and division are used to generate rules similar to the Guess My Rule $\oplus$ $\ominus$ activity. Be aware that some calculators may require different keystrokes to set the constant function for multiplication and division. Consult the manual for your calculator or try the following:

For example, to multiply by 5, enter

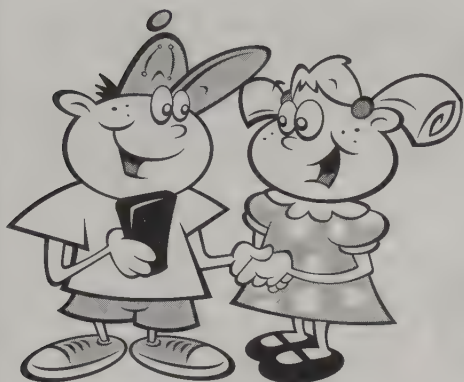


In **A Step Beyond**, students generate “divided by” rules. Decimal displays are certain to occur and will have to be interpreted by students as they identify a pattern to guess the rule.

Patterns with Zeros: This activity can be conducted with the whole class. First, direct students to use their calculator to complete the top part of the activity sheet. Keep a tally of the number of seconds each child takes to complete this section. Ask students to describe any patterns they see. Now instruct the class to complete the bottom part of the sheet without the calculator. Suggest that they look for a pattern to use. Keep a tally of the number of seconds each child takes to complete this section. Discuss whether it was faster to use the calculator or to compute mentally. Encourage students to explain why the calculator isn't always the fastest or most efficient way to compute.

What's the Pattern?

Can you tell what number comes next?



WORK TOGETHER!

Use your calculator to count.
Watch the display window each
time you press [=].

$$\text{ON/C} \quad + \quad 2 \quad = \quad = \quad = \quad \dots$$

$$\text{ON/C} \quad + \quad 5 \quad = \quad = \quad = \quad \dots$$

$$\text{ON/C} \quad + \quad 10 \quad = \quad = \quad = \quad \dots$$

$$\text{ON/C} \quad 1 \quad + \quad 2 \quad = \quad = \quad = \quad \dots$$

$$\text{ON/C} \quad 30 \quad + \quad 5 \quad = \quad = \quad = \quad \dots$$

$$\text{ON/C} \quad 20 \quad + \quad 10 \quad = \quad = \quad = \quad \dots$$

Press [=] a few
more times.

WRITE ABOUT IT!

What different patterns do you see?

What does the [=] button do?

TALK ABOUT IT!

Talk about your patterns. What number
would come next in each count?



What's Next?

Can you tell what number comes next?

WORK TOGETHER!

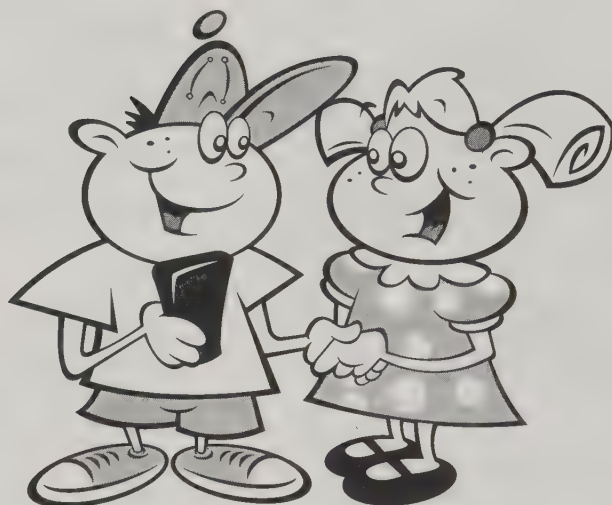
Use your calculator to count.
Watch the display window each
time you press [=].

A. ON/C 3 + 1 = = = ...

ON/C 5 + 1 = = = ...

B. ON/C 1 0 - 1 = = = ...

ON/C 8 - 1 = = = ...



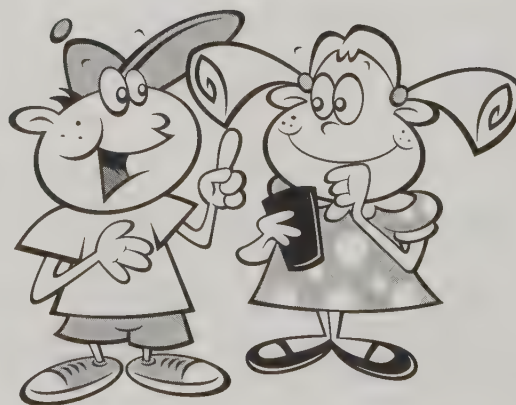
WRITE ABOUT IT!

What's the pattern for A?

What's the pattern for B?

TALK ABOUT IT!

Talk about your patterns.
What number would come
next in each count?



Eyes Closed, Eyes Open

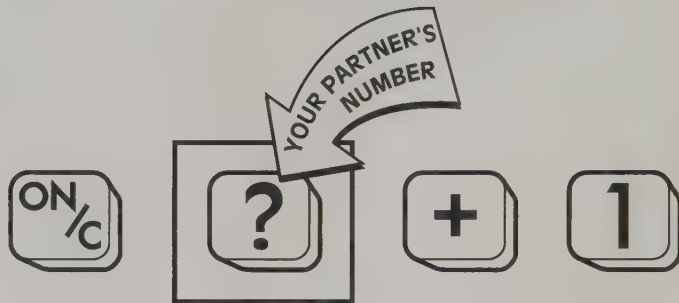
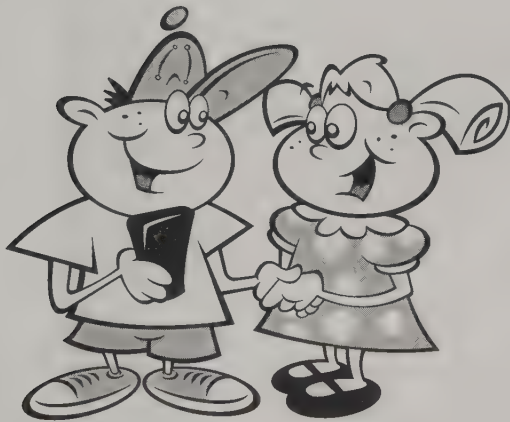
Can you count to the target?

WORK TOGETHER!

Use your calculator to count.

Your target number is 12.

Have your partner pick a number less than 12 and enter:

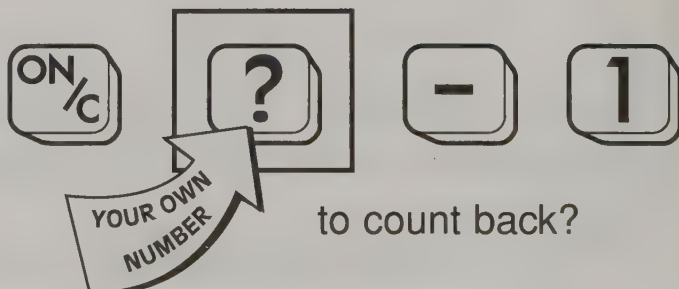


- Close your eyes and press [=] [=] until you think that you have hit the target number 12.
- Open your eyes to see if you hit the target.

TALK ABOUT IT!

What if you choose your own target number?

Could you play this target game using:



to count back?

100 Chart

If you mark the numbers your calculator shows, what patterns do you see?

WORK TOGETHER!

Use your calculator to count: $0 + 2 = = = \dots$

- Have your partner use a counter to cover each new number on the *100 Chart*.
- Stop when you get to 50.
- Write a sentence that describes the pattern.
- Remove the counters and press ON/C on your calculator.
- Try using 1 instead of 0 and show the counting pattern on the *100 Chart*.



WRITE ABOUT IT!

Compare the patterns you found.

- How are they alike?
- How are they different?

WHAT IF?

What if you counted by a number other than 2?

Try the activity again and use a number other than 2.



YOU'LL NEED:

the *100 Chart* and small counters.

100 CHART

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Chart Patterns

What sum patterns can you find for sums on the *100* and *200 Charts*?

WORK TOGETHER!

Pick any three numbers in a line:

34
44
54

6		
	17	
		28

21	22	23
----	----	----

		7
	16	
25		

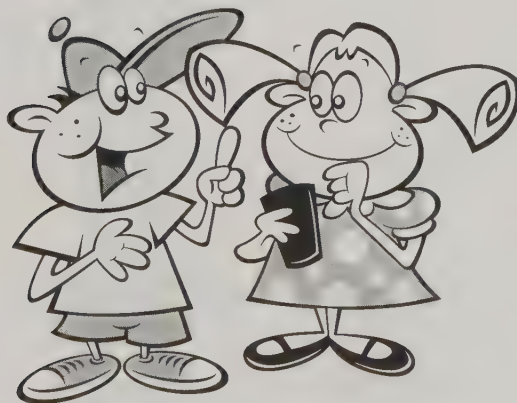
How does the middle number compare to the sum of the other numbers? Use your calculator to help.

- Pick any square of numbers:
- Use your calculator to find patterns about sums.

76	77
86	87

25	26	27	28
35	36	37	38
45	46	47	48
55	56	57	58

125	126	127
135	136	137
145	146	147



TALK ABOUT IT!

Share the patterns you found.

TALK ABOUT IT!

Write down three patterns you noticed.



YOU'LL NEED:

the *100* and *200 Charts* and small counters.

200 CHART

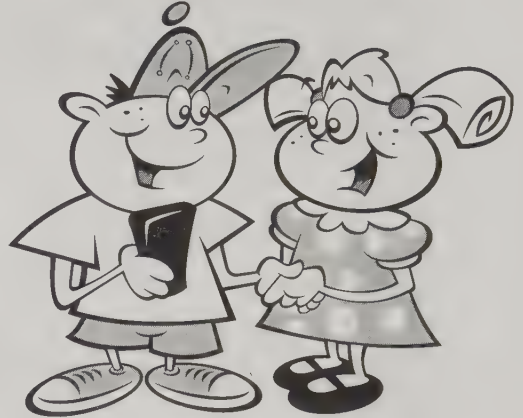
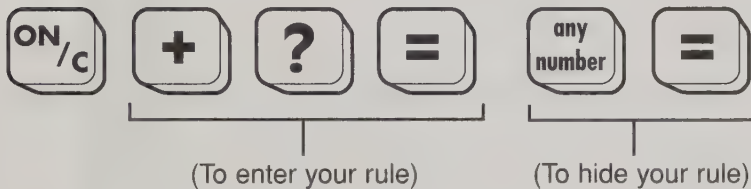
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	170
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

Guess My Rule: $+$ $-$

If you press $=$, can you guess my rule?

WORK TOGETHER!

Without letting your partner see,
pick a number for $?$ and enter:



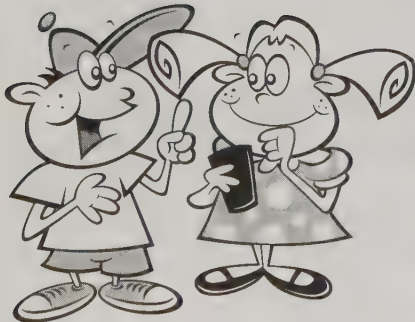
- Have your partner press: "any number" $=$ to try to guess the rule.

— or —

- Press: "any number" $=$ $=$ $=$ to find the rule.

- Try different rules.

Sometimes use:



TALK ABOUT IT!

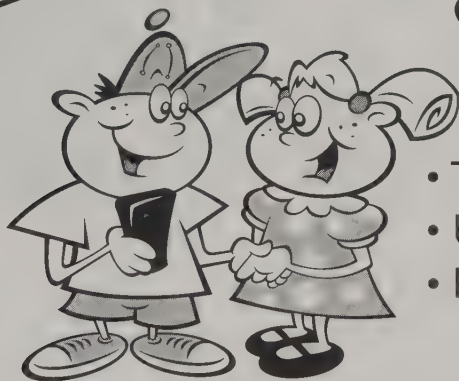
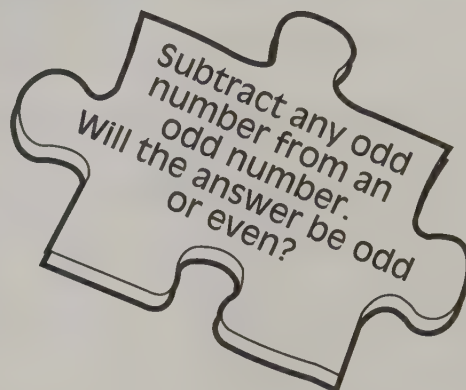
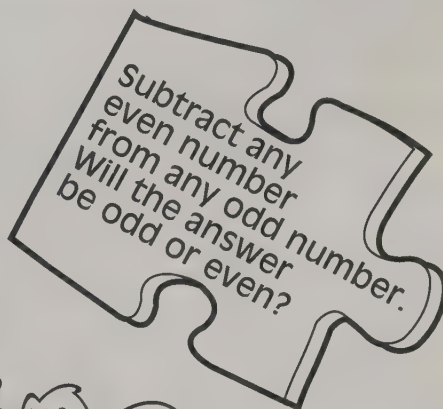
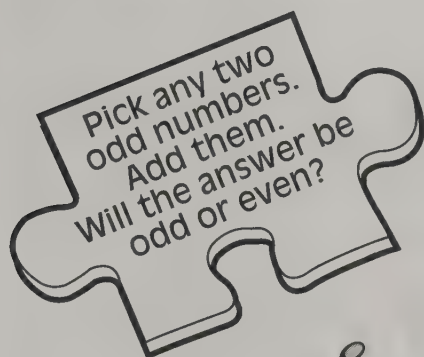
How did you guess the rule?

Odd or Even?

When you $+$ or $-$, can you predict when an answer will be odd or even?

WORK TOGETHER!

Think about each puzzle before you use your calculator.



- Tell your partner what you think.
- Use your calculator to test numbers.
- Keep a record of your work.

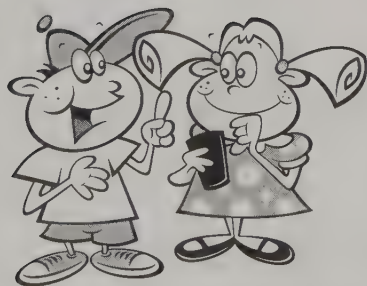
TALK ABOUT IT!

When you $+$ or $-$ two numbers, how can you get:

- an odd answer?
- an even answer?

Does this always work with:

- one-digit numbers?
- two-digit numbers?
- even larger numbers?



My Turn, Your Turn:

Can you predict whether the answer will be odd or even?

WORK TOGETHER!

Take turns:

- Close your eyes to enter a number.
Punch one or more number keys.
- Have your partner press:  
- Predict whether the answer will be even or odd.
- Press  to check.
- Keep a record of your work.
- Stop when you find five odd numbers and five even numbers.
- Repeat, but instead of using , use .



WRITE ABOUT IT!

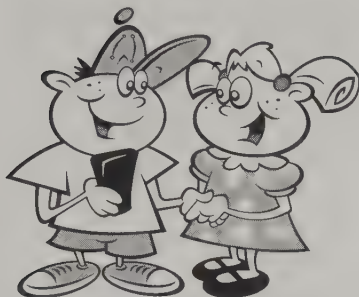
What information did you use to predict whether an answer would be even or odd?

TALK ABOUT IT!

Share your ideas with your classmates. What did you learn about odd and even numbers?

Evens vs. Odds

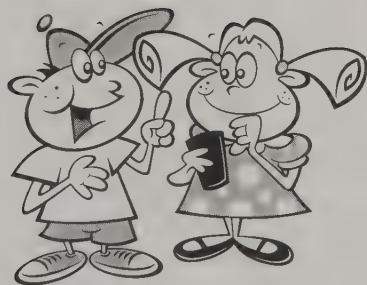
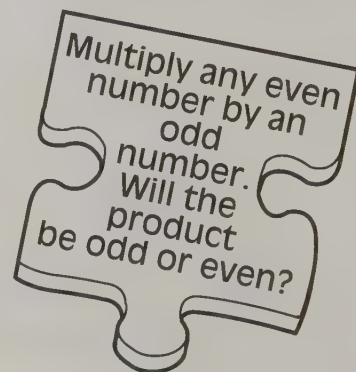
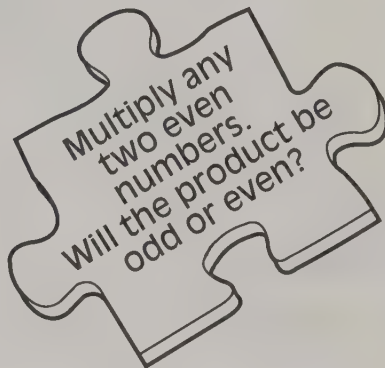
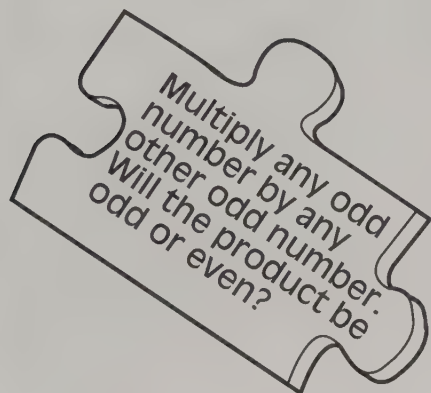
When you $\times$, can you predict when an answer will be odd or even?



WORK TOGETHER!

Think about each puzzle before you use your calculator.

- Tell your partner what you think.
- Use your calculator to test numbers.
- Keep a record of your work.



TALK ABOUT IT!

When you $\times$ two numbers, how can you get:

- an odd product?
- an even product?

Does this always work with:

- one-digit numbers?
- two-digit numbers?
- even larger numbers?

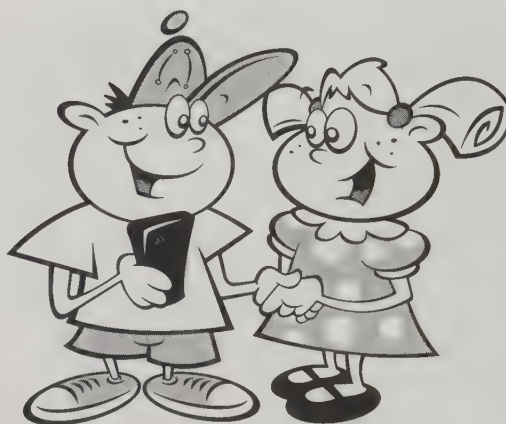
My Turn, Your Turn:

Can you predict whether the product will be odd or even?

WORK TOGETHER!

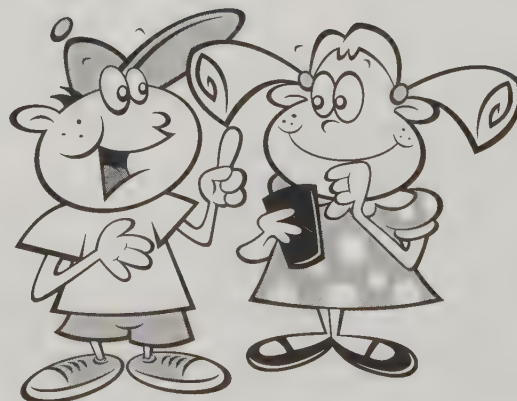
Take turns:

- Close your eyes to enter a number.
Punch one or more number keys.
- Have your partner press  .
- Predict whether the answer will be even or odd.
- Press  to check.
- Keep a record of your work.
Stop when you find five odd numbers and five even numbers.



WRITE ABOUT IT!

What information did you use to predict whether an answer would be even or odd?



TALK ABOUT IT!

Share your ideas with your classmates.
What did you learn about multiplying odd and even numbers?

Guess My Rule: $\times$ $\div$

If you press $=$, can you guess my rule?

WORK TOGETHER!

Without letting your partner see,

pick a number for $?$ and enter:

ON/C

$?$

$\times$

$=$

(To enter your rule)

any number

$=$

(To hide your rule)

- Continue pressing: any number $=$ as needed to find the rule.
- Have your partner press: any number $=$ to try to guess the rule.
- Have your partner press: any number $=$ $=$ $=$... to find the rule.
- Try other numbers for $?$.
- Try different rules.

A STEP BEYOND!

Pick a number for $?$ and enter:

$?$

$\div$

$=$

to enter your rule.

What happens when you press:

any number

$=$

over and over again?



WRITE ABOUT IT!

What do you think will happen when you press $\times$ after you have pressed $=$ many times?

What do you think will happen when you press $\div$ after you have pressed $=$ many times?

Try it!

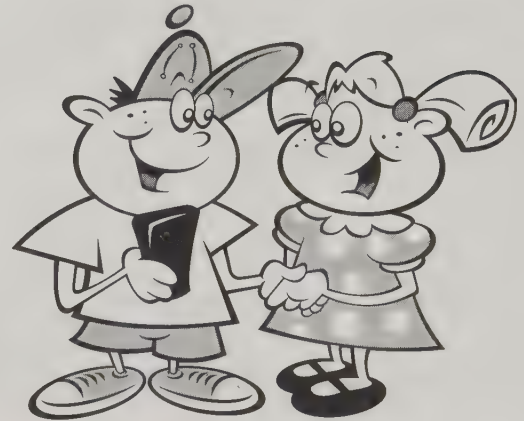
Patterns with Zeros

Can you use patterns for shortcuts?

WORK TOGETHER!

Use your calculator for the top part of the *Problem Sheet*. Time how long it takes you to complete the math problems.

DO NOT USE YOUR
CALCULATOR FOR
THIS NEXT PART.



Complete the math problems on the bottom part of the *Problem Sheet*. Time how long it takes you to complete the math problems.



TALK ABOUT IT!

Did it take more time to do the top or the bottom part of the *Problem Sheet*? Explain. Did you find any shortcuts?



YOU'LL NEED:

the *Patterns with Zeros Problem Sheet*.

PATTERNS WITH ZEROS PROBLEM SHEET

$$\begin{array}{r} 3 \\ +4 \\ \hline \end{array}$$

$$\begin{array}{r} 30 \\ +40 \\ \hline \end{array}$$

$$\begin{array}{r} 300 \\ +400 \\ \hline \end{array}$$

$$\begin{array}{l} 5 \times 3 = \underline{\quad} \\ 50 \times 3 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 50 \times 30 = \underline{\quad} \\ 500 \times 3 = \underline{\quad} \end{array}$$

$$\begin{array}{r} 6 \\ +2 \\ \hline \end{array}$$

$$\begin{array}{r} 60 \\ +20 \\ \hline \end{array}$$

$$\begin{array}{r} 600 \\ +200 \\ \hline \end{array}$$

$$\begin{array}{l} 4 \times 2 = \underline{\quad} \\ 40 \times 2 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 40 \times 20 = \underline{\quad} \\ 400 \times 2 = \underline{\quad} \end{array}$$

$$\begin{array}{r} 8 \\ -2 \\ \hline \end{array}$$

$$\begin{array}{r} 80 \\ -20 \\ \hline \end{array}$$

$$\begin{array}{r} 800 \\ -200 \\ \hline \end{array}$$

$$\begin{array}{l} 7 \times 2 = \underline{\quad} \\ 70 \times 2 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 70 \times 20 = \underline{\quad} \\ 700 \times 2 = \underline{\quad} \end{array}$$

$$\begin{array}{r} 2 \\ +2 \\ \hline \end{array}$$

$$\begin{array}{r} 20 \\ +20 \\ \hline \end{array}$$

$$\begin{array}{r} 200 \\ +200 \\ \hline \end{array}$$

$$\begin{array}{l} 4 \times 3 = \underline{\quad} \\ 40 \times 3 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 40 \times 30 = \underline{\quad} \\ 400 \times 3 = \underline{\quad} \end{array}$$

$$\begin{array}{r} 3 \\ +6 \\ \hline \end{array}$$

$$\begin{array}{r} 30 \\ +60 \\ \hline \end{array}$$

$$\begin{array}{r} 300 \\ +600 \\ \hline \end{array}$$

$$\begin{array}{l} 6 \times 2 = \underline{\quad} \\ 60 \times 2 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 60 \times 20 = \underline{\quad} \\ 600 \times 2 = \underline{\quad} \end{array}$$

$$\begin{array}{r} 7 \\ -3 \\ \hline \end{array}$$

$$\begin{array}{r} 70 \\ -30 \\ \hline \end{array}$$

$$\begin{array}{r} 700 \\ -300 \\ \hline \end{array}$$

$$\begin{array}{l} 5 \times 5 = \underline{\quad} \\ 50 \times 5 = \underline{\quad} \end{array}$$

$$\begin{array}{l} 50 \times 50 = \underline{\quad} \\ 500 \times 5 = \underline{\quad} \end{array}$$

Section 2: Number Sense

OVERVIEW

The Number Sense activities encourage students to develop their intuitions about numbers and operations using estimation and mental computation. Through constructing and testing conjectures, students build on informal understandings and develop more systematic problem-solving strategies. The calculator's memory functions are introduced and featured in several activities.

TEACHING NOTES

Enough Money to Buy? Estimation is the focus of this activity. Have students cut out the bakery cards. Students predict whether they have enough money to purchase selected items at the bakery. Then they check their predictions with their calculator. Question students to elicit and encourage different strategies for estimating.

No More, No Less: Most students will benefit from working through this activity as a whole class before working with partners. This is one of several activities that involves a target number. Beginning with a selected number entered into the calculator, students perform a sequence of operations to reach the target number. They are challenged to reach the target in four steps, that is, to use four operations beginning with the start number and ending with the target number. Encourage students to find more than one way to reach the target and remind them to record each step as a number sentence. After practicing in pairs, this activity could be presented as a class tournament in which teams challenge each other to reach a target in a given number of steps.

Hit the Target: This activity is appropriate for students beginning to develop operation sense with multi-digit numbers. Children should be encouraged to find and record many different ways of making each target number, using the calculator, if necessary, to check their thinking.

Two Tries: Four randomly selected digits are arranged to make two factors whose product is as close as possible to a target number. Encourage students to generate several number sentences to find the product that is closest to (or equal to) the target number. Observe and listen to groups as they work to assess students' use of number sense and estimation skills in determining which factors to use. The Talk About It discussion should focus on students' solution strategies. This activity can be modified to change the level of difficulty by using different target numbers, operations, or numbers of digits.

No! No! Keys: In this target activity, one operation and three digits are eliminated from use as students construct a number sentence to produce the target number. Encourage students to find more than one number sentence for a given target.

Yard Sale: This whole-class activity introduces students to the calculator's memory functions. Students keep track of how much money they have left after buying items at a yard sale. Students will find it necessary to use decimal notation when entering amounts of money into the calculator, and to interpret a numerical display of 0.4 as 40¢, for example. In the Talk About It section, students consider the role of the memory recall key and discuss what the numbers in the display indicate.

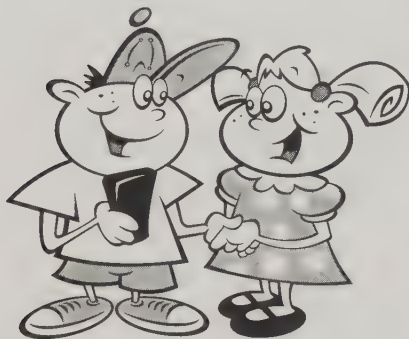
Go For It! This activity features the calculator's memory functions. Students devise a winning strategy for reaching a target number with their calculator. Keeping a written record of each player's moves will assist students in developing strategies. Many students find it helpful to work backwards as they plan a series of turns.

Start to Finish: In this problem-solving activity, pairs of students use estimation to determine which path along a maze will produce the most number of points. During class discussion, students share estimation strategies and justify the selection of certain solution paths. Have students create their own mazes.



Enough Money to Buy?

Is there enough money to buy what is listed on the *Bakery Cards*?

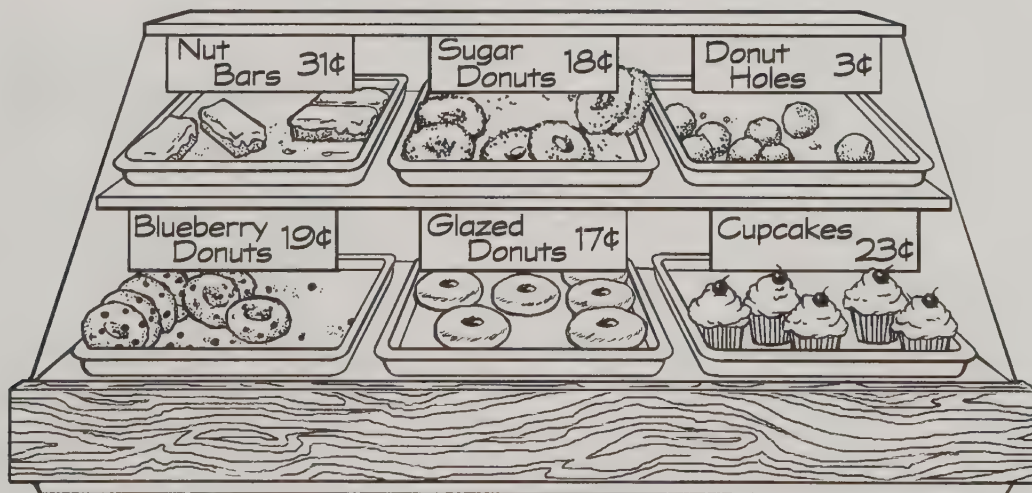


WORK TOGETHER!

- Read a *Bakery Card*.
- Predict whether there is enough money to buy what is listed.
- Use your calculator to check as needed.
- Make up your own *Bakery Cards*.
Trade with classmates.

WRITE ABOUT IT!

What estimation strategies did you use?
Describe one or two you liked best.



YOU'LL NEED:

the *Bakery Cards* page.

Bakery Cards

50¢ to spend

1 dozen
donut holes
and
2 glazed donuts



50¢ to spend

1 blueberry
and
1 glazed
donut



75¢ to spend

1 nut bar
and
2 sugar
donuts



75¢ to spend

1 cupcake
3 sugar donuts
and
1 glazed donut



\$1 to spend

2 blueberry
donuts
and
3 glazed
donuts



\$1 to spend

2 sugar
donuts
and
2 cupcakes



_____ to spend

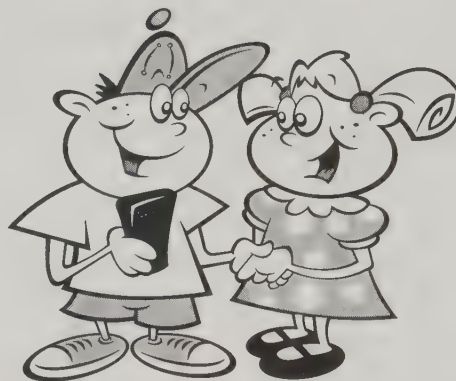
_____ to spend

Four Steps

Can you hit the target in four steps?

WORK TOGETHER!

- Pick a start number. Pick one of these:
3 5 8 10
- Punch it in on your calculator.
- Pick an end number. Pick one of these:
0 30 75
- Try to reach it in exactly four steps.



WRITE ABOUT IT!

Record your steps. Try different ways or go for a new start or end number. Choose your own numbers.

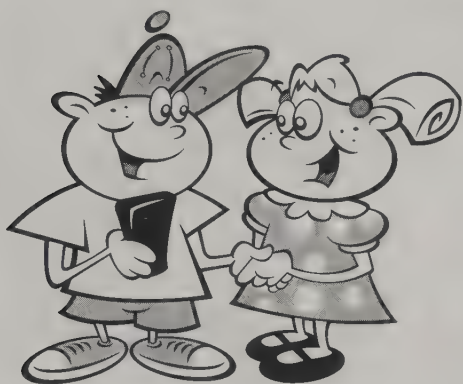
TALK ABOUT IT!

How many different ways did you come up with to reach your target number? Are there more ways?



Hit the Target

What numbers should be entered to make the target number?



WORK TOGETHER!

- Close your eyes and enter a two-digit target number.
- Open your eyes and record the target number.
- Decide what two numbers can be added to make the target number.

WRITE ABOUT IT!

Keep track of all the ways you find. Try a new target number or try using or .



TALK ABOUT IT!

Tell how you solved the problem.
How did you come up with the numbers you chose?

Two Tries

What numbers should be entered to get close to the target number?

WORK TOGETHER!

Pick a target number from the following numbers:

1500, 2000, 3500, 4000, 5500

Have your partner close his or her eyes and enter four digits on the calculator.

- Record the digits.
- Rearrange the digits to get close to the target number when you multiply.

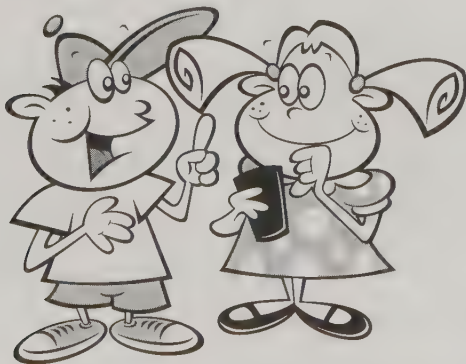
?	×	?	?	?	=
?	?	×	?	?	=

- Use the same digits again. Try to get closer.



WRITE ABOUT IT!

Record the number sentence that gets you closest to the target number.



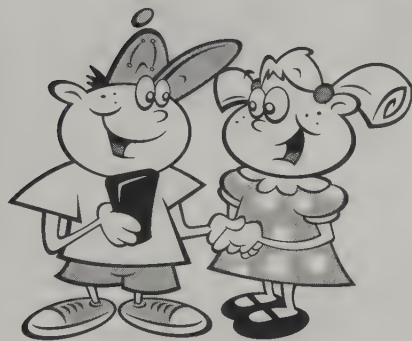
TALK ABOUT IT!

Tell how you solved the problem. How did you rearrange the digits to get to the target number?

No! No! Keys

What keys can you punch so the calculator displays the target?

WORK TOGETHER!



Pick four “No! No!” keys from below that you will not use:

Cross off one of these keys:



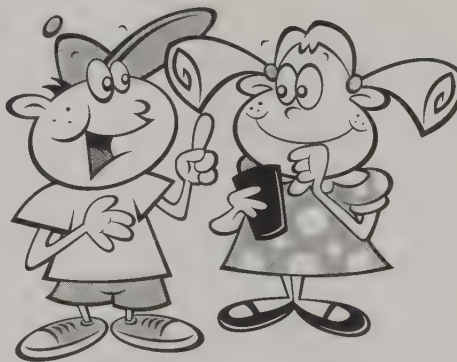
Cross off three of these keys:



- Pick a target number from the following numbers: **50, 63, 100, 175**
- Without using a “No! No!” key, try to make your calculator show the target number.

TALK ABOUT IT!

What keys worked for different target numbers?
How did you decide?



WRITE ABOUT IT!

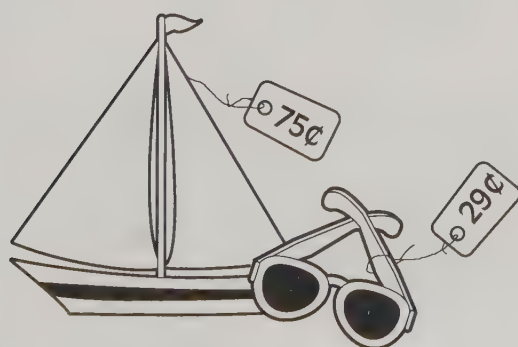
Record the keystrokes you used. Try different ways to reach your target number. Choose a new target number and try again.

Yard Sale

How much money will you have left?

WORK TOGETHER!

- Press **ON/C** to clear the memory.
- From the amounts listed, choose how much money you will take to a yard sale:
\$2.00, \$3.00, \$5.00
- Enter your amount and then **M+** into your calculator.
- Pick something to buy.
- Enter its price and press **M-**.
- Pick a few other items and enter their prices as you did above.
- Press the **M_{RC}** key to see how much money you have left.

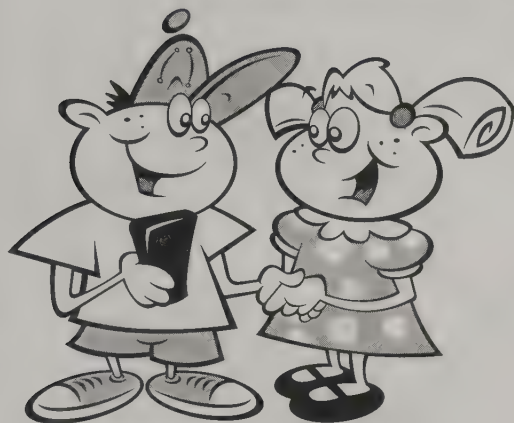


TALK ABOUT IT!

When you press **M_{RC}**, what does the number in the display window represent?
How is **M+** different from **M-**?

Go For It!

Is there a winning strategy to hit the target number?



WORK TOGETHER!

Pick a target number from the following numbers: **15, 21, 35**

By adding in the memory, try to reach this target without going over.

- Press M_C twice to clear the memory.
- Take turns entering numbers 1 through 5, followed by the $M+$ key.
- Press M_C to find the sum of all the numbers put into memory.

WRITE ABOUT IT!

Is there a strategy for reaching the target number first?

What is the fewest number of turns to reach the number?

What is the most number of turns?



TALK ABOUT IT!

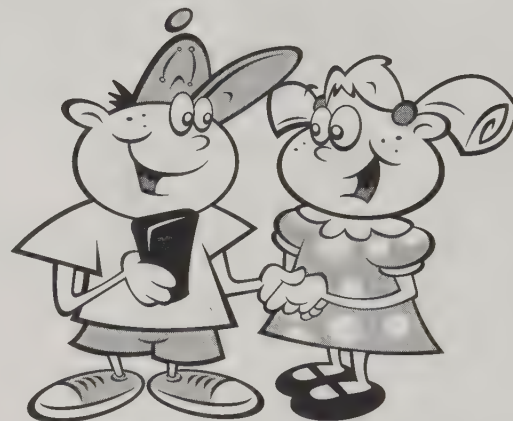
Share what you found.

Start to Finish

What path to the finish gets you the most points?

WORK TOGETHER!

- Study the number maze.
- Predict a path that will give you the most points.
- Always go down, left, or right; never go back up.
- Add or subtract in your head as you go.
- Use your calculator to help or check.
- Record the points of the path you choose.
- Do the maze again. Try for the fewest points.

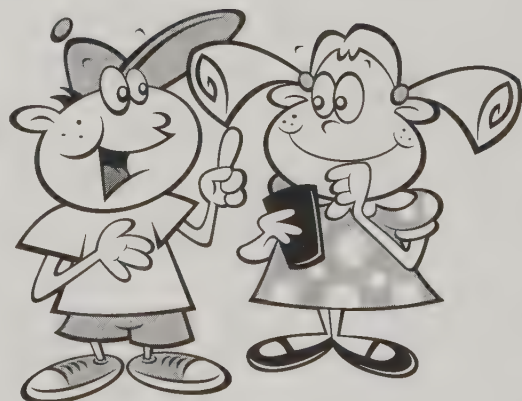


WRITE ABOUT IT!

How did you choose your path?
What strategies did you use?

TALK ABOUT IT!

Compare your path
with your partner.

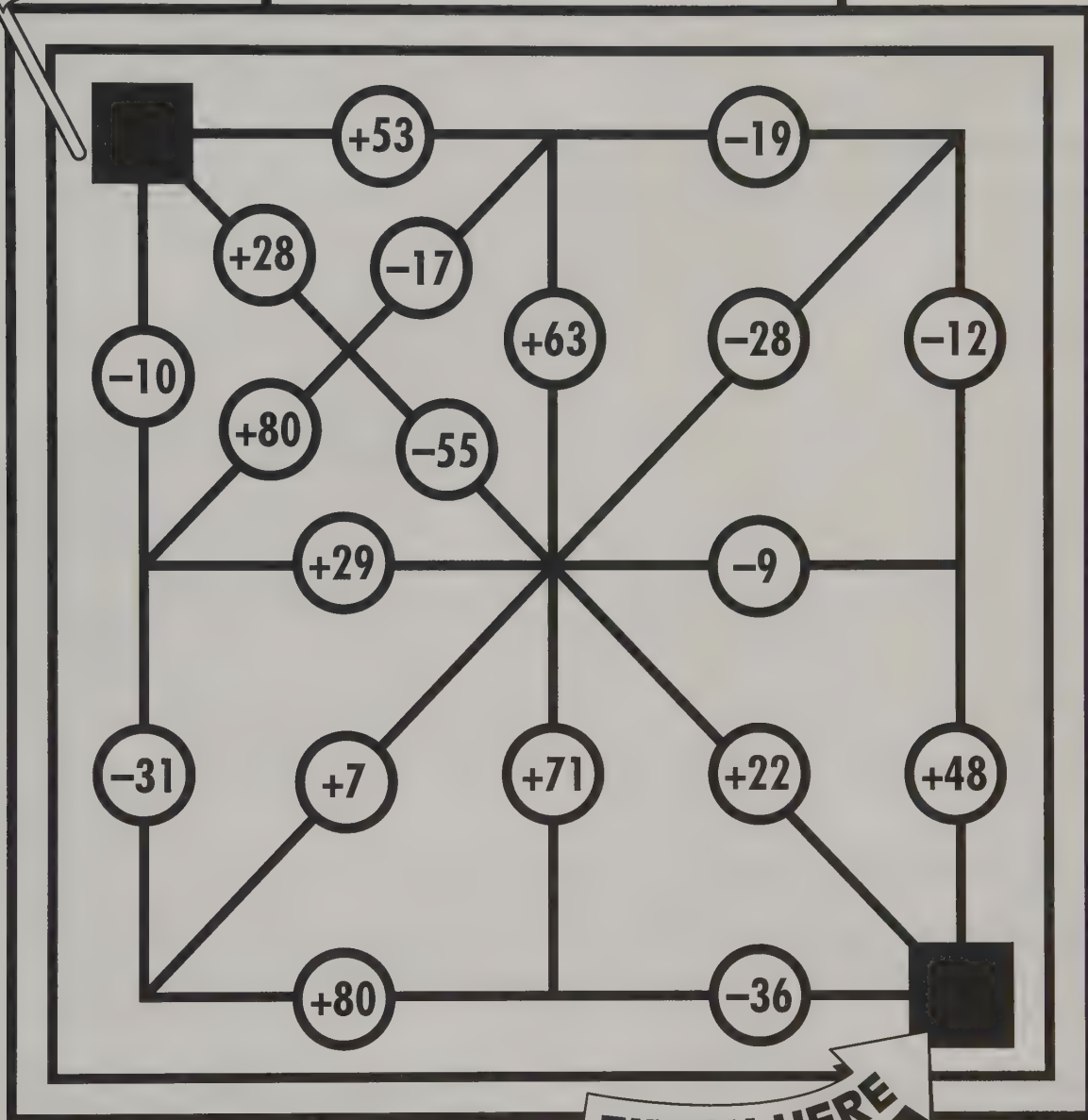


YOU'LL NEED:

the *Start-to-Finish Maze*.

START TO FINISH MAZE

START HERE



FINISH HERE

Section 3: Measurement

OVERVIEW

The activities in this section involve linear measurement, using both English and metric systems. Measurements of perimeter and area are also addressed. Estimation and mental computation are emphasized in most activities. The concept of average is explored informally.

TEACHING NOTES

How Much Closer? Students estimate and measure, in centimeters, a series of line segments representing two paths. Mental computation should be encouraged at first. Then, use a calculator to total the lengths of the line segments or to compute the actual distance according to the given scale. In *A Step Beyond*, students are challenged to determine how long it would take different animals to travel the paths. The following data is presented as a reference:

Animal	Mph	Animal	Mph	Animal	Mph	Animal	Mph
Cheetah	70	Elk	45	Pig	11	Human	25
Zebra	40	Coyote	43	Wild Turkey	15	Greyhound	39
Grizzly	30	Lion	40	Grey Fox	42	Garden Snail	0.03
Rabbit	35	Chicken	9	Elephant	25	Giant Tortoise	0.17
Giraffe	32	Cat	30	Squirrel	12	Reindeer	32

How Much Closer Now? In this activity, pairs of students construct new paths for the animals in the activity called *How Much Closer?* Students should measure and record the actual distances of their paths before trading papers with another group. Remind students to estimate before they measure. Estimation is the focus of this exercise.

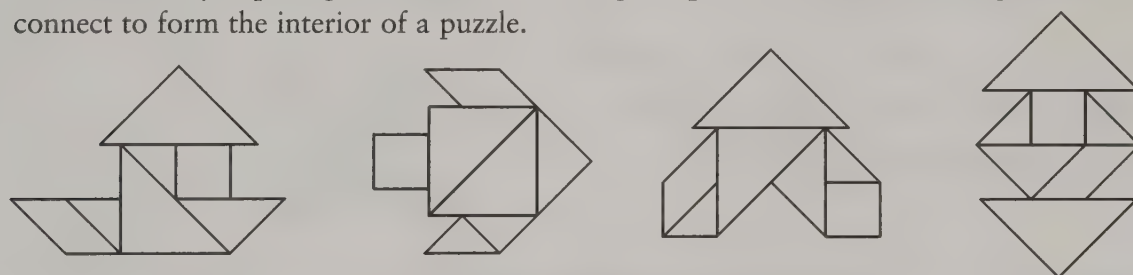
How Does It Average Out? In this activity, students informally explore the concept of average by comparing their heights using square-inch strips of paper. Working in groups of six, students cut and paste segments of their strips so that all the heights in their group average out to be about the same. A measuring tape or other device for measuring height in inches should be displayed in the classroom. Also, post a class list of names on which students can record their heights to the nearest inch.

Clip Drop: Students measure the distance, in centimeters, between two paper clips for another context for exploring the concept of average. This activity follows the same format as the activity called *How Does It Average Out?*

How Many Steps? After determining the average number of steps required to walk ten yards, students use this information to estimate distances between places in the school or on the playground. Although averages should be computed for groups of six to eight, students can work in pairs or individually to find the number of steps in ten yards.

This activity could be conducted over two class periods—collecting data one day and determining averages the next. It is likely that the average number of steps for many groups will involve decimals. Promote discussion about the meaning of decimals in terms of the number of steps. Change the level of difficulty by using different target numbers, operations, or numbers of digits.

A Longer Perimeter: Students construct tangram puzzles having different perimeters. Listen to students as they work to assess their use of strategies for making a perimeter longer or shorter. For example, some students might conclude that a longer perimeter can be made by exposing more sides of the tangram pieces rather than having sides connect to form the interior of a puzzle.



How Many? Use this activity prior to addressing the concept of area. As students determine how many dots are in each region, strategies such as finding the number of dots in a row and multiplying by the number of rows may emerge.

A. $13 \times 24 = 312$

C. $14 \times 35 = 490$

E. $(13 \times 10) + (23 \times 12) = 406$

B. $19 \times 19 = 361$

D. $43 \times 30 = 1,290$

What Area is Covered? The concept of area is explored informally as students determine how many square units cover a given region.

A. $10 \times 10 = 100$

D. $(30 \times 20) + (20 \times 15) = 900$

B. $12 \times 30 = 360$

E. $(20 \times 10) + (15 \times 20) + (20 \times 10) = 700$

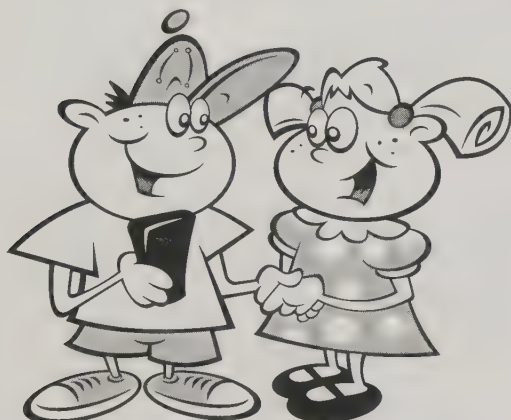
C. $(30 \times 30) + (20 \times 10) = 1,100$

F. $(20 \times 30) - (10 \times 15) = 450$

How Much Closer?

Which animal is closer to water?

How many miles closer is that animal?



WORK TOGETHER!

- Measure each piece of the elephant's path to water in centimeters.
- Mentally add the lengths of each part of the path.
- Have your partner measure and add the lion's path.
- Check your addition estimates with your calculator.

WRITE ABOUT IT!

Using the scale $1 \text{ cm} = 3 \text{ miles}$, tell how far each animal must travel to find water.

How do the distances compare?



A STEP BEYOND!

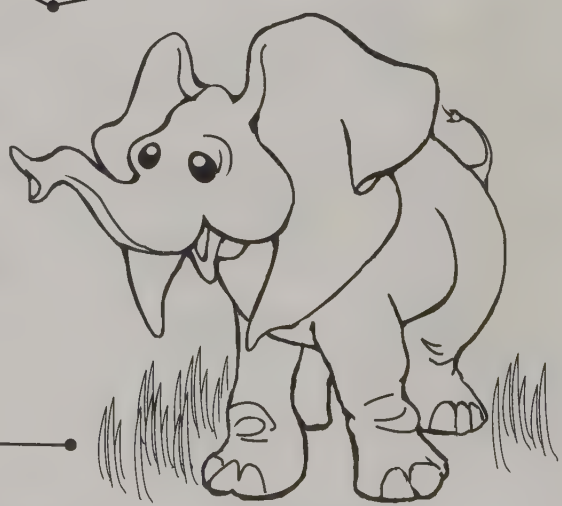
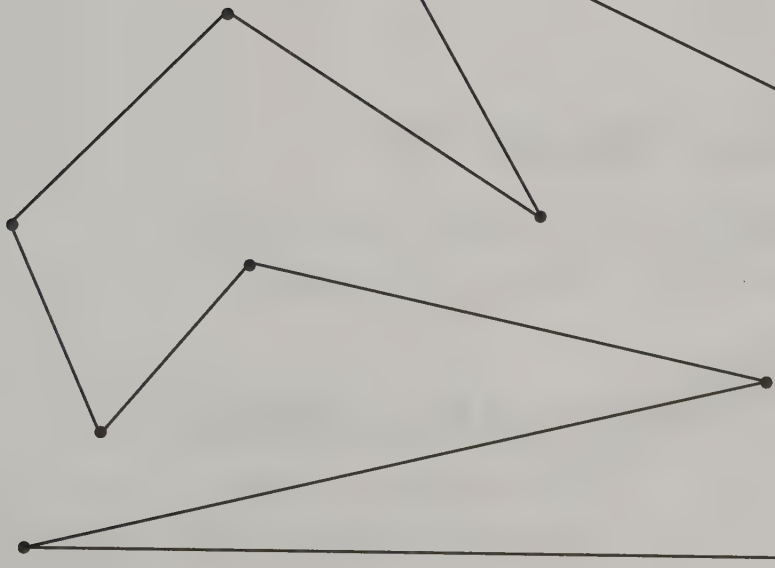
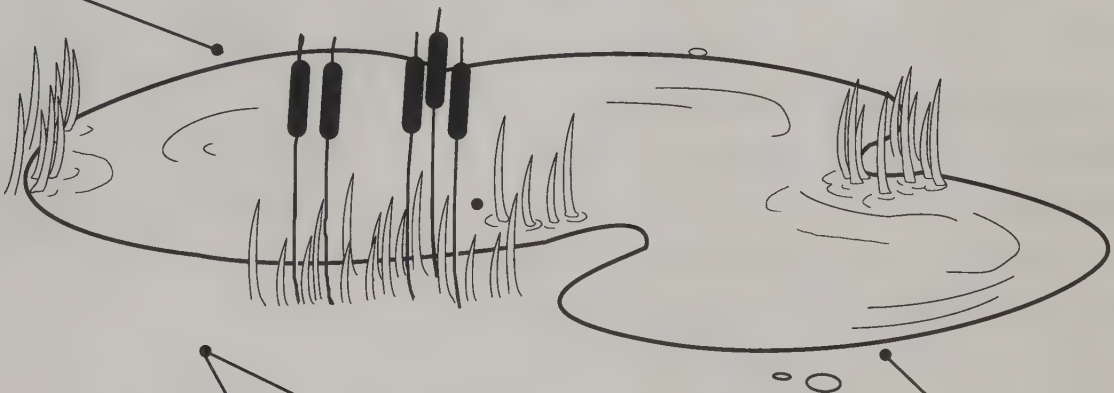
Research typical travel speeds of animals. About how long might it take different animals to travel the paths to the water?



YOU'LL NEED:

the *Animal Paths* map and a centimeter ruler.

Animal Paths



How Much Closer Now?

Which animal do you estimate is closer to the water?

WORK TOGETHER!

- The elephant and the lion must find new paths to the water.
- Draw a new path for each animal.
- Measure each path in centimeters and tell the scale:
1 cm = miles.
- Trade papers with another group.
- Estimate which animal's path to the water is shorter.
- Measure both paths. Mentally add the lengths of each part of the paths or use your calculator to help.
- Using the scale from above, how far must each animal travel to water?



TALK ABOUT IT!

Explain what strategies you used to estimate the lengths of the paths.



YOU'LL NEED:

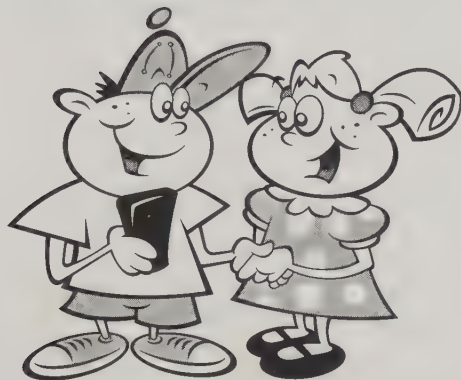
the *Create Your Own Animal Paths* map and a centimeter ruler.

Create Your Own Animal Paths



How Does It Average Out?

What's a typical height for someone in your class?



WORK TOGETHER!

- Measure your height in inches.
- Record it on the class chart.
- Cut and tape square-inch strips together to show your height.
- Join with other students to form a group of six.
- Compare your strip to others in your group.
- Cut inch squares off longer strips and tape them to the shorter ones, until all of the strips average out to be about the same height.

TALK ABOUT IT!

Use a calculator. Find the sum of the heights of all in your group. Then divide by the number of students in the group. That is the **average**.

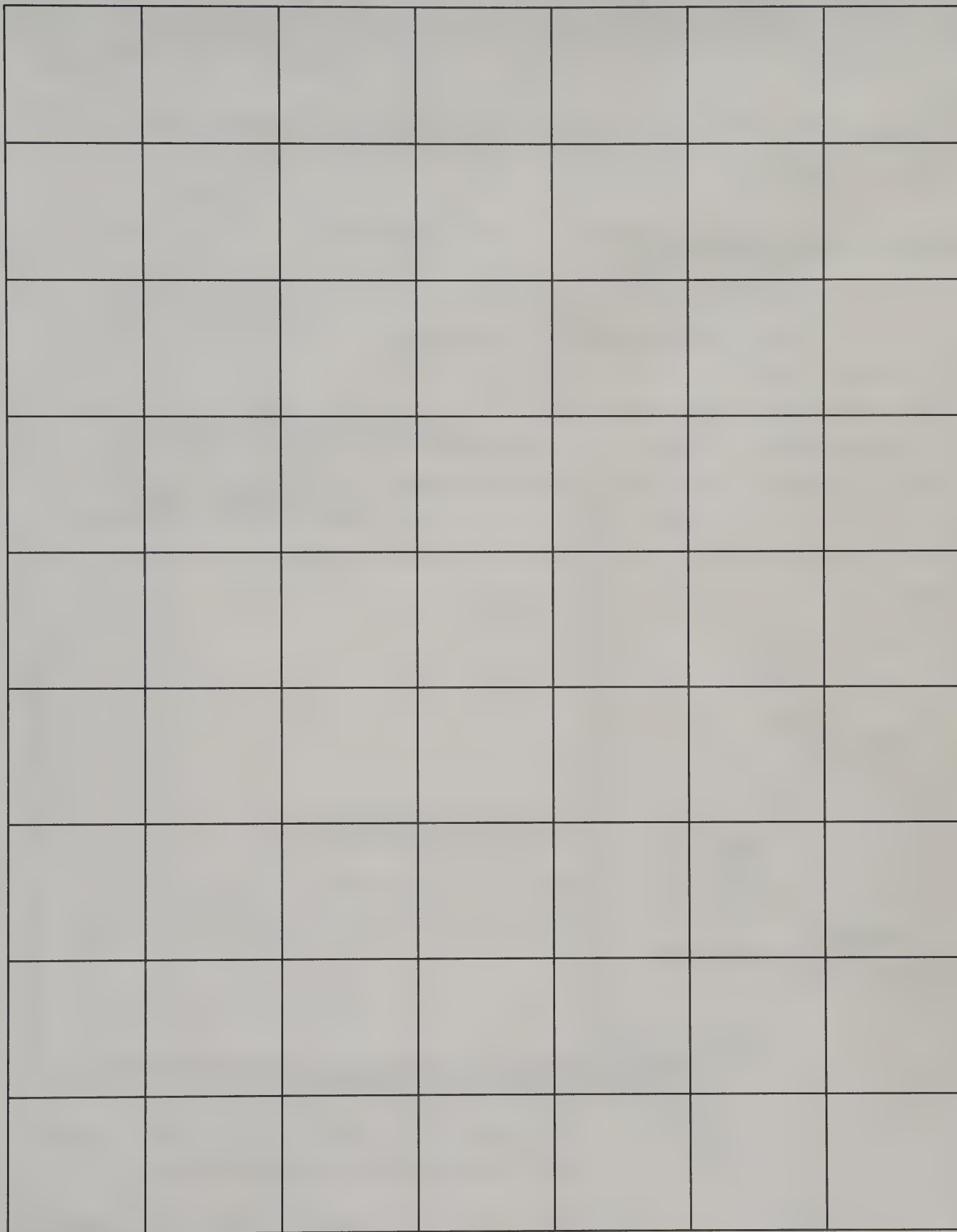
How does your work with the calculator compare to what you did with the strips?



YOU'LL NEED:

tape, *Square-Inch Paper*, and a measuring tape.

Square-Inch Paper

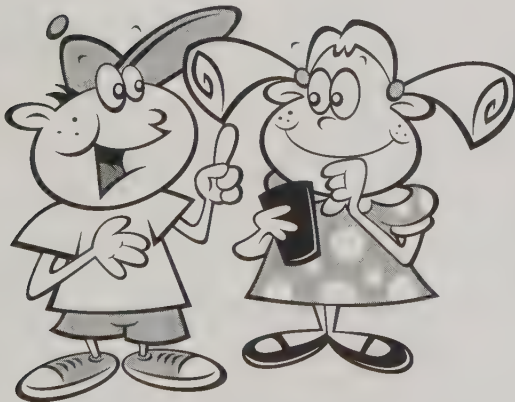
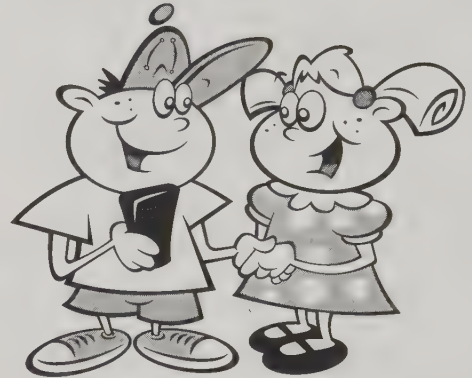


Clip Drop

What is the average distance between paper clips in the *Clip Drop Game*?

WORK TOGETHER!

- Play the *Clip Drop Game*.
- Cut centimeter strips to show how far apart the clips landed.
- Compare the lengths of ten strips.
- Cut centimeters off longer strips and tape them to shorter ones until all strips average out to be about the same length.
- Use a calculator. Find the sum of the distances on the *How Far Apart?* table. Divide by 10.



TALK ABOUT IT!

How does your work with the calculator compare to what you did with the strips?



YOU'LL NEED:

two paper clips, tape, the *Clip Drop Game*, and the *Square-Centimeter Paper*.

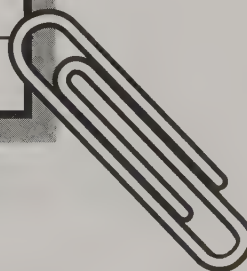
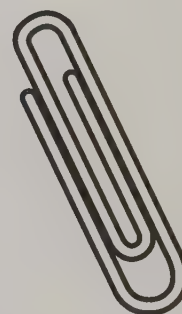
Clip Drop Game

Take turns.

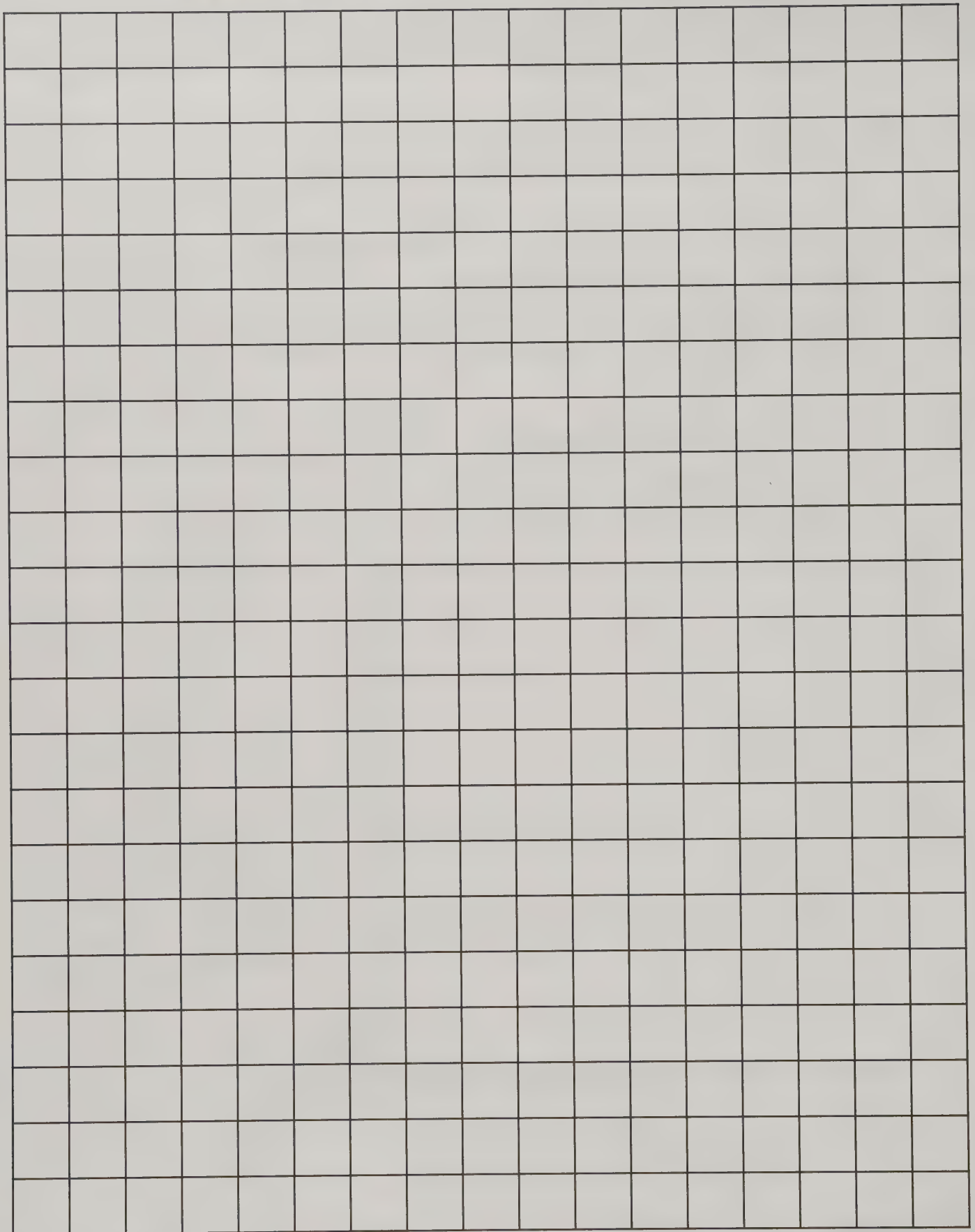
- Hold two paper clips in one hand, waist high.
- Drop them.
- Have your partner measure the distance between the clips to the nearest centimeter.
- Record the measurements on the table below.
- Repeat the drop nine more times to fill the chart.

How Far Apart?

Drop	Distance in Centimeters
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



Square-Centimeter Paper

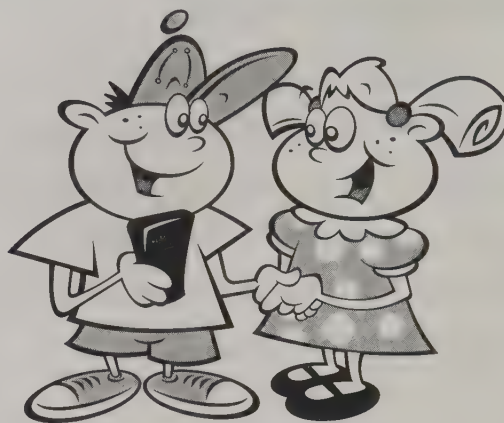


How Many Steps?

What is the average number of steps needed to walk 10 yards?

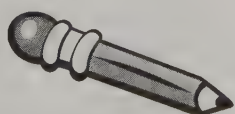
WORK TOGETHER!

- Form a group of six students.
- Use a yardstick to measure and mark off 10 yards.
- Have each group member walk with normal-sized steps.
- Count how many steps it takes to walk 10 yards.
- Record each member's steps on the group chart.
- Use a calculator to find the average number for the group.
- How does your group's average compare to other groups?



WRITE ABOUT IT!

Without using a yardstick, estimate the number of yards between two places in the school or on the playground. Explain how using what you know about the number of steps in 10 yards might help you get the best estimate.



YOU'LL NEED:

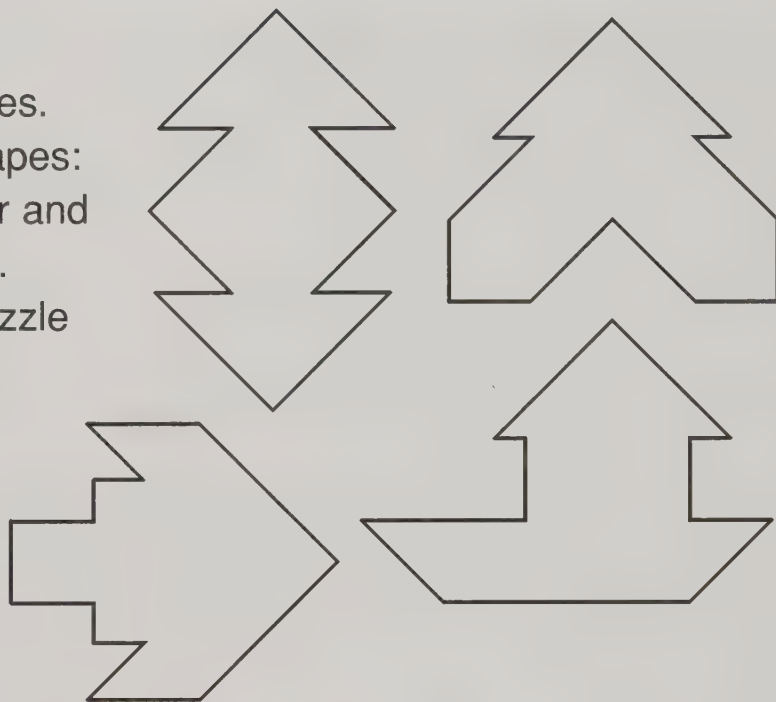
a yardstick.

A Longer Perimeter

Which tangram puzzle shape has the longer perimeter?

WORK TOGETHER!

- Cut out the seven tangram pieces.
- Solve one of these tangram shapes:
- Glue the shape puzzle on paper and find its perimeter in centimeters.
- Try to make a second shape puzzle with a longer perimeter.



TALK ABOUT IT!

Did you have a plan for making a longer perimeter?



A STEP BEYOND!

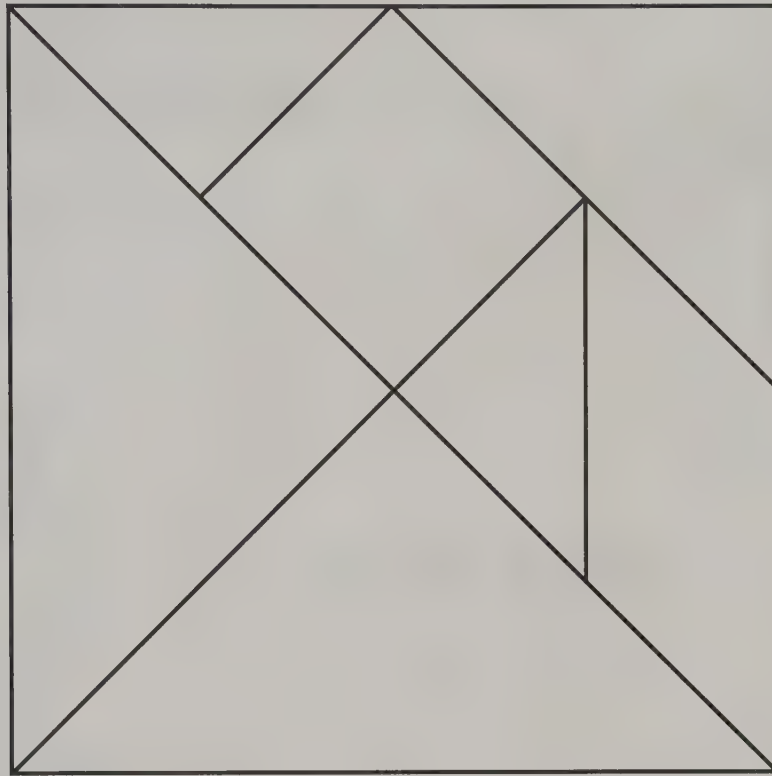
- Using only the triangles, which shape has the longest perimeter? Which shape has the shortest perimeter?
- Using different tangram pieces, find the longest and shortest perimeters possible.



YOU'LL NEED:

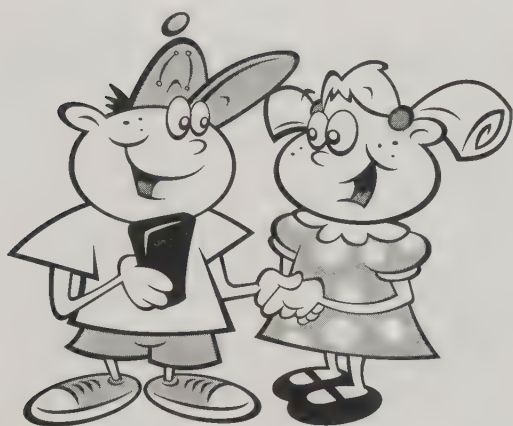
scissors, glue, *Tangram Puzzle Pieces*, and a ruler.

Tangram Puzzle Pieces



How Many?

About how many dots do you think make each shape?

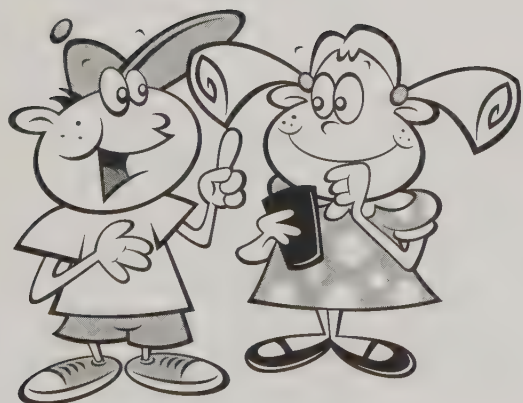


WORK TOGETHER!

- Predict how many dots are in each shape.
- Use a calculator to help you find how many dots are in each shape.

WRITE ABOUT IT!

What strategies did you use?



TALK ABOUT IT!

How close were your predictions?
How do your strategies compare
with what others did?

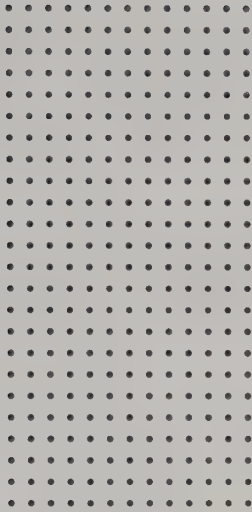


YOU'LL NEED:

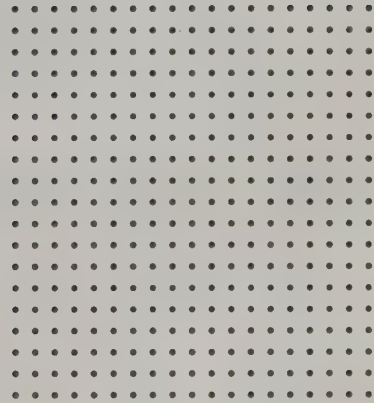
the *Dot Shapes* worksheet.

DOT SHAPES

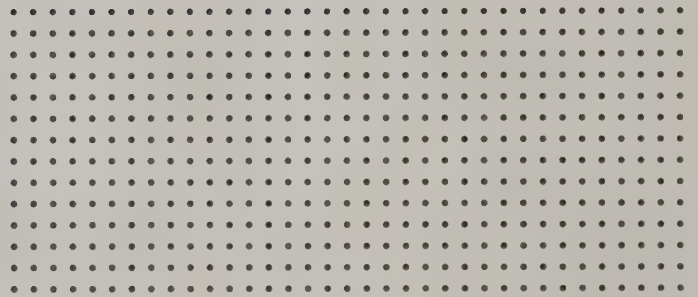
A



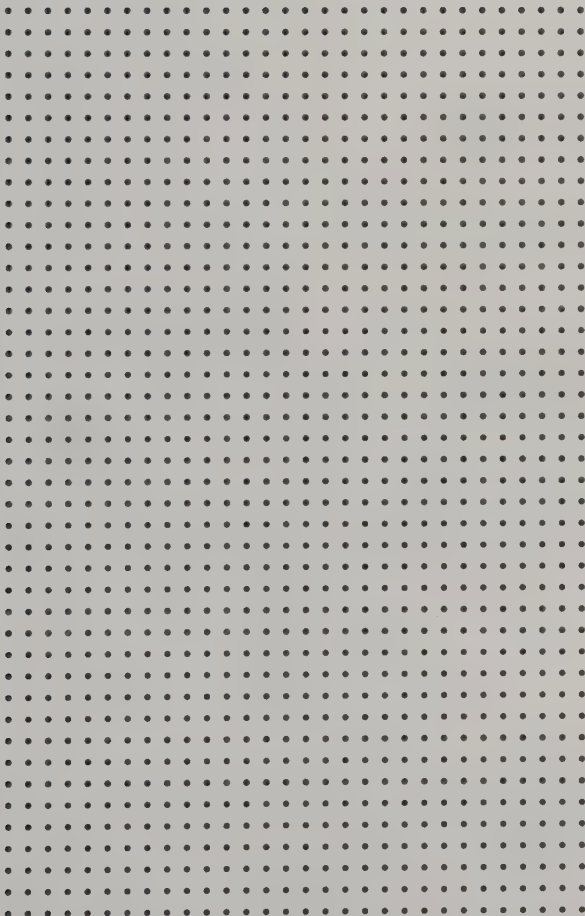
B



C



D



E

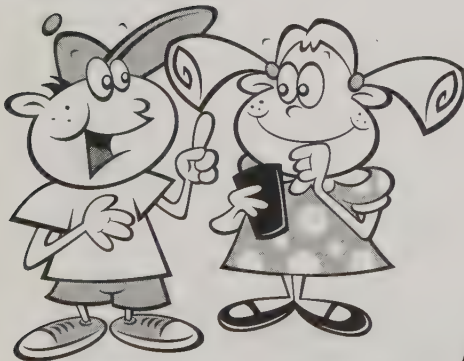
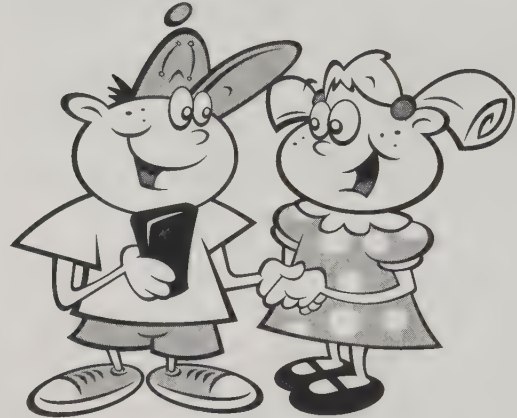


What Area Is Covered

About how much area do you think each shape covers?

WORK TOGETHER!

- Show on this grid:
 - 1 unit of length
 - 1 unit of width
 - 1 square unit of area.
- Use your calculator to find how many square units are covered by each shape on the grid sheet.
- Record your findings.

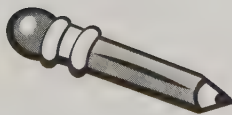


TALK ABOUT IT!

How did you find the area of each shape?

A STEP BEYOND!

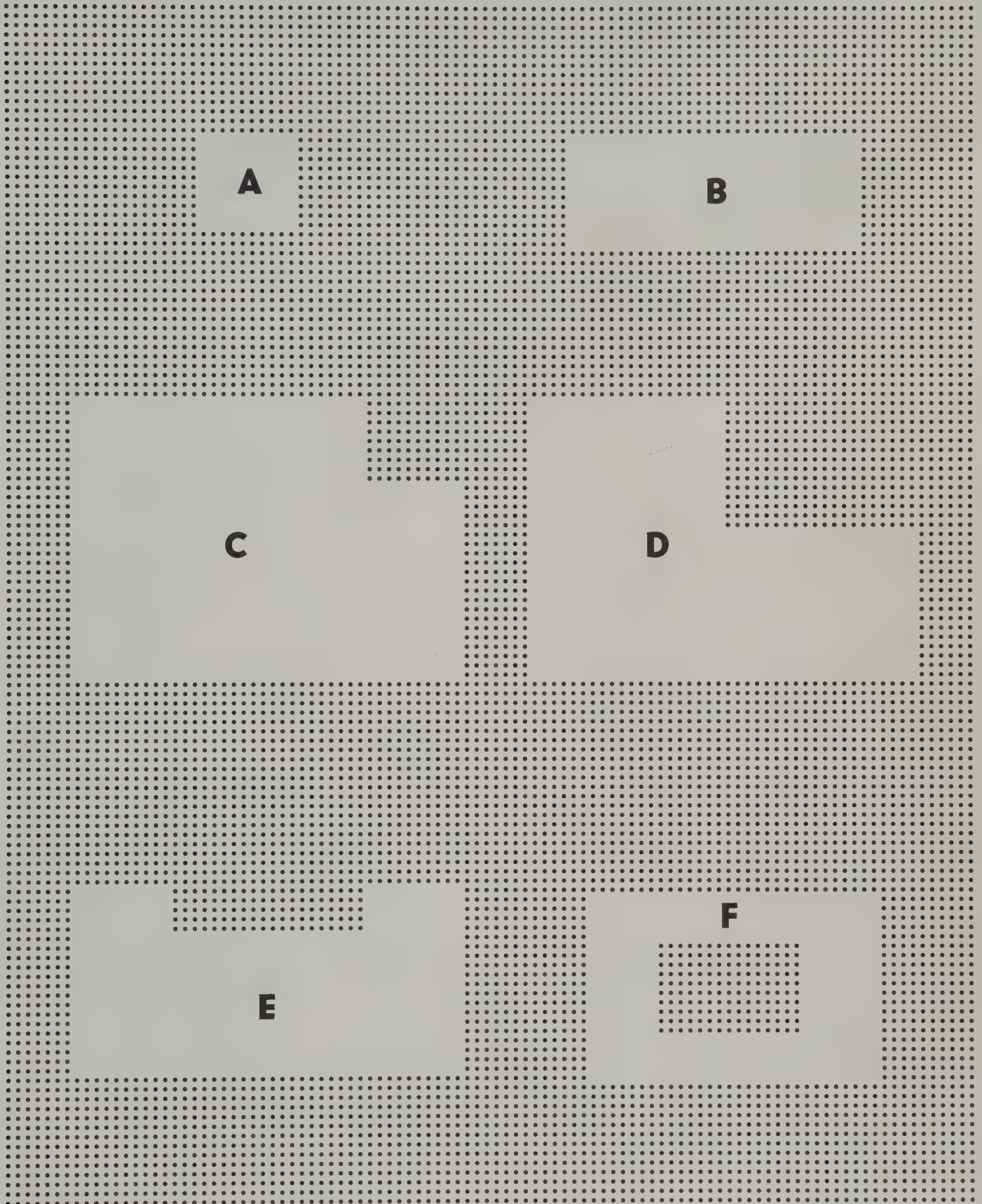
Use your own shapes to cover the dots. Trade with classmates and find the areas.



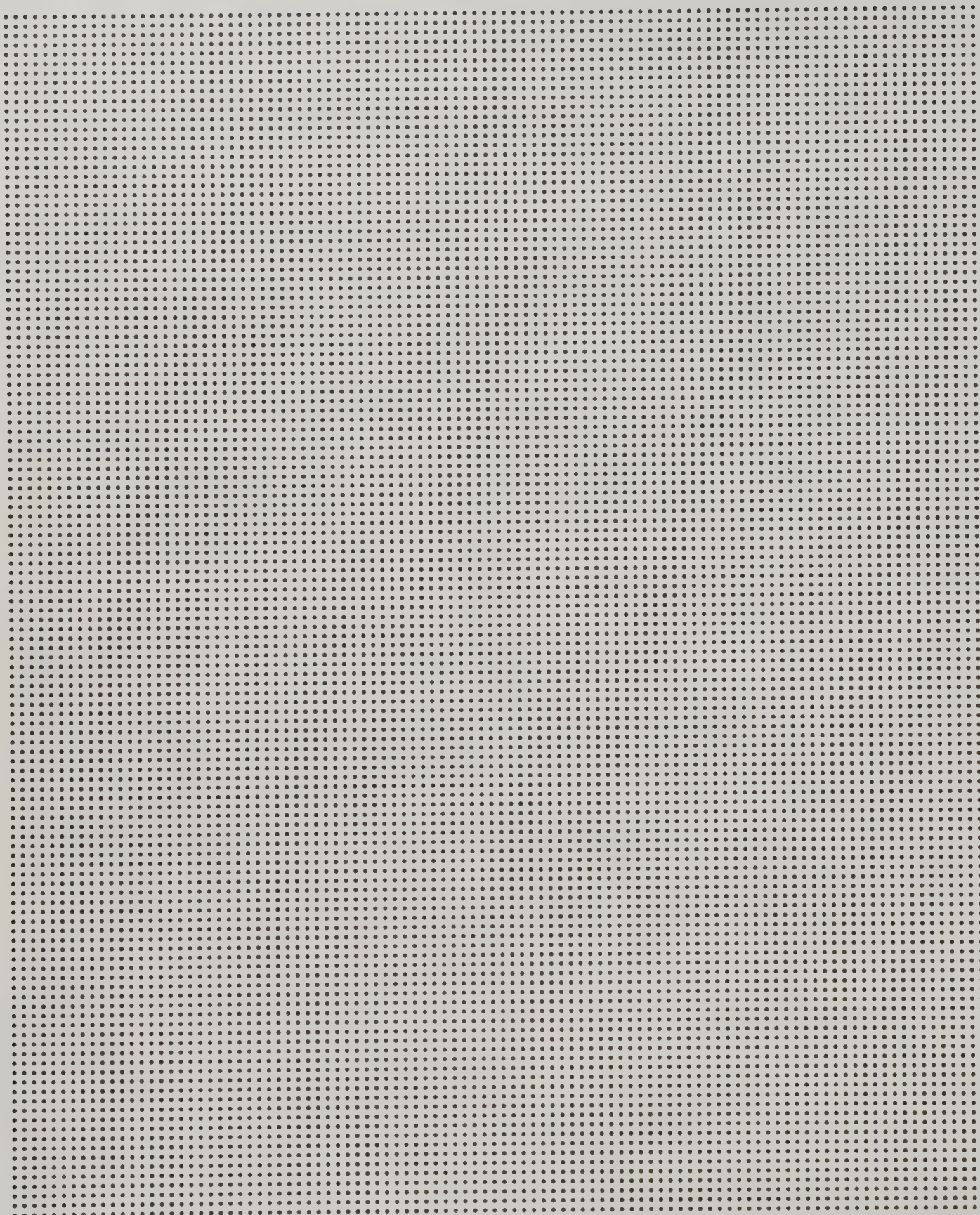
YOU'LL NEED:

the *What Area Is Covered?* dot chart and
the *Use Your Own Shapes* dot chart.

What Area Is Covered?



Use Your Own Shapes



Section 4: Data and Chance

OVERVIEW

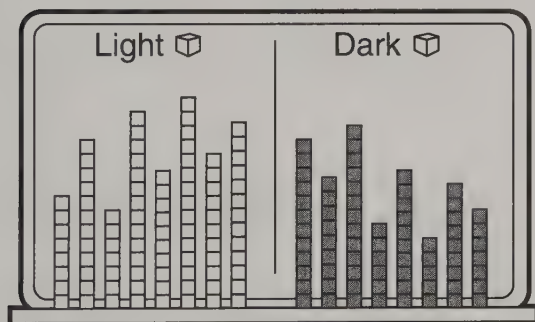
The activities in this section focus on collecting, displaying and interpreting data. Students consider notions of chance in terms of predicting outcomes based on their interpretations of data collected from repeated trials of an experiment.

TEACHING NOTES

Mystery Shake: In this activity, students consider whether it is better to make predictions based on large or small samples of data. Each pair of students will need a paper lunch bag with one corner snipped (just enough to allow a cube to be visible without falling through). Bags should contain ten cubes, eight of one dark color and two of one light color. Staple or seal bags in some other way so that students cannot look inside until they are instructed to do so.

As a whole-class activity, students discuss ways of finding the average number of light and dark cubes. After all ideas have been shared, have someone actually rearrange the cubes to even them out as a way of showing the average.

About How Many? Students work in pairs to collect data about light and dark cubes. These data are recorded numerically on a class chart and collections of cubes are displayed on the chalk ledge. If it is difficult to stack the cubes, arrange them in separate piles on a table.



Team	Light 	Dark 
1		
2		
3		
4		
5		
6		

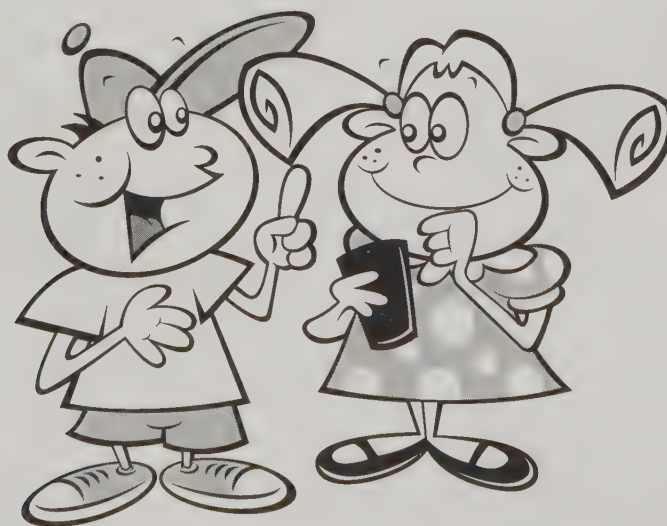
Who Is Closer? Students look for trends in performance data to indicate whether or not there is improvement with practice. Each pair of students will need a dictionary or other large book.

How Many Spaces? In this activity, students encounter a situation in which finding an average is not necessarily the most appropriate solution to the problem. Students use tallies to record the number of letters in their last names. A frequency chart, like the one below, should be displayed on the chalkboard or overhead projector for students to record their data.

Number of Letter	Tally	Frequency
3		
4		
5		
6		
7		
8		

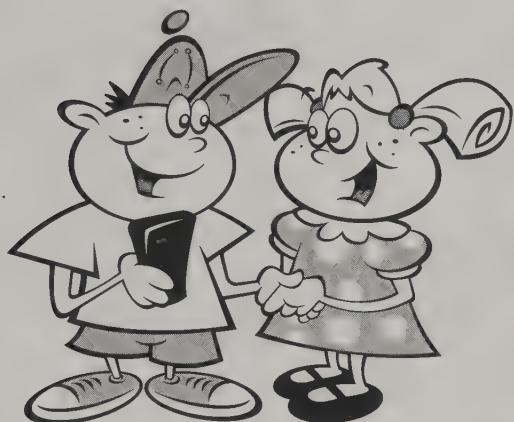
Computing the class average for number of letters in the last name will require multiple steps and may warrant whole-class discussion before students are instructed to write about it.

How Close? In this whole-class activity, students close their eyes and estimate when one minute has elapsed. As you time one minute, record the number of seconds (in five second intervals) on the overhead. When students open their eyes, the last number displayed will indicate their estimate. Have students use tallies on a frequency chart to record the number of seconds their eyes were closed. Use this data to compute the class average.



Mystery Shake

Ten cubes of two colors are in a bag. After ten shakes, can you predict how many of each color are left in the bag?



WORK TOGETHER!

- Take turns shaking the bag.
- Peek at the cube sticking out.
- Tally the color.
- After ten shakes, predict the number of light and dark cubes in the bag.
- Repeat the activity with a new tally.
Do you want to revise your prediction?
- On the class chart, record how many light and dark cubes are sticking out of the bag.
- Use your calculator to find the average for each color.
- Open your bag and count the light and dark cubes.

WRITE ABOUT IT!

Which is best, a prediction based on your team's data or a prediction based on the class data?
Explain your thinking.



YOU'LL NEED:

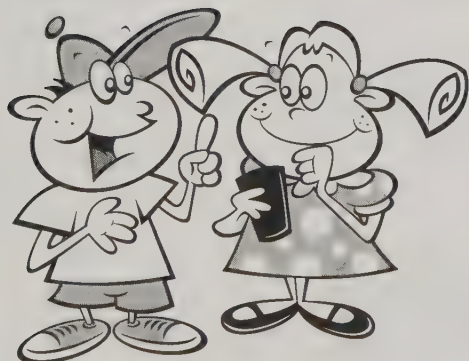
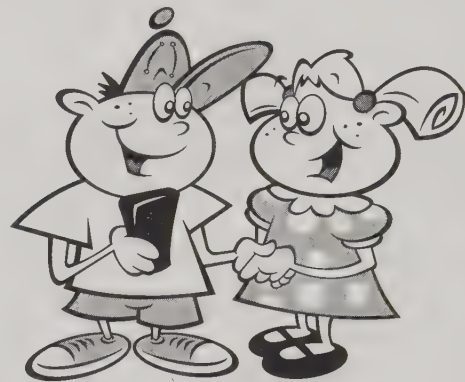
ten cubes of two colors and a paper lunch bag.

About How Many?

Do you think there will be more light or more dark cubes after twenty spins of the *Color Chooser*?

WORK TOGETHER!

- Take turns spinning the *Color Chooser*.
- Take a cube indicated by the *Color Chooser*.
- Stop when you have twenty cubes.
- On a class chart, record how many light and dark cubes you have.
- Make a light cube train and a dark cube train.
- Set your cube train on a chalk ledge.



TALK ABOUT IT!

What could you do to find the average number of light cubes:

- by moving cubes?
- by using a calculator?

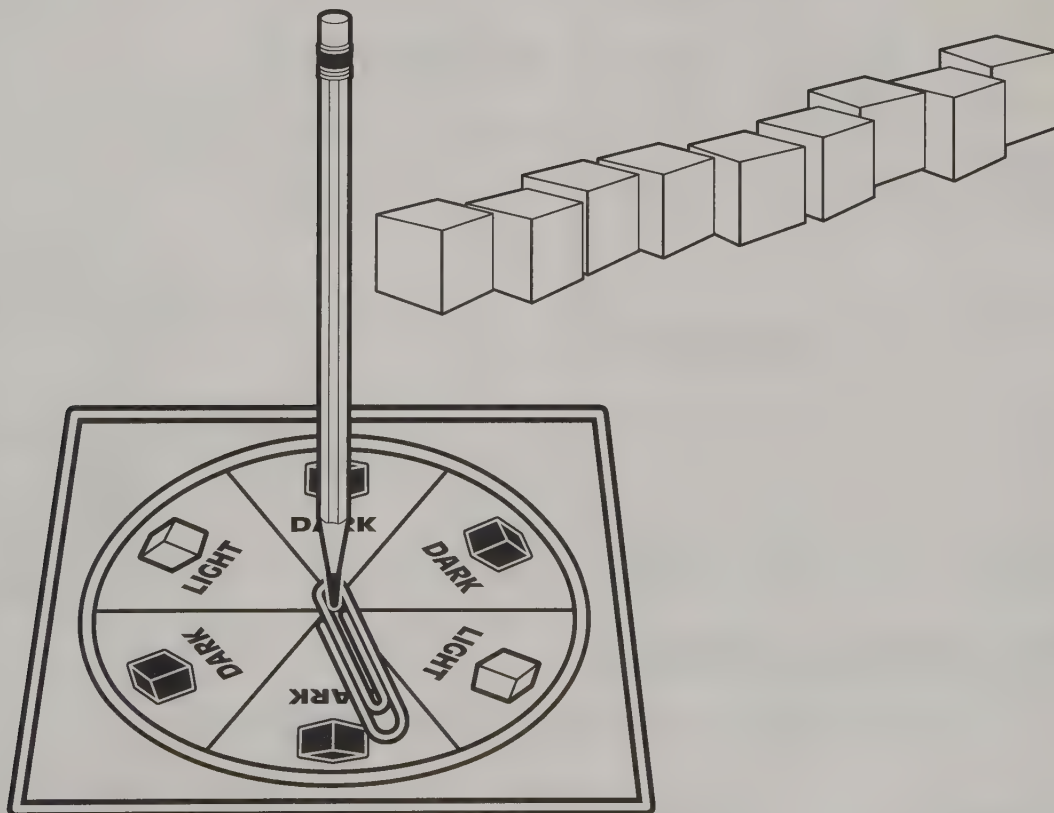
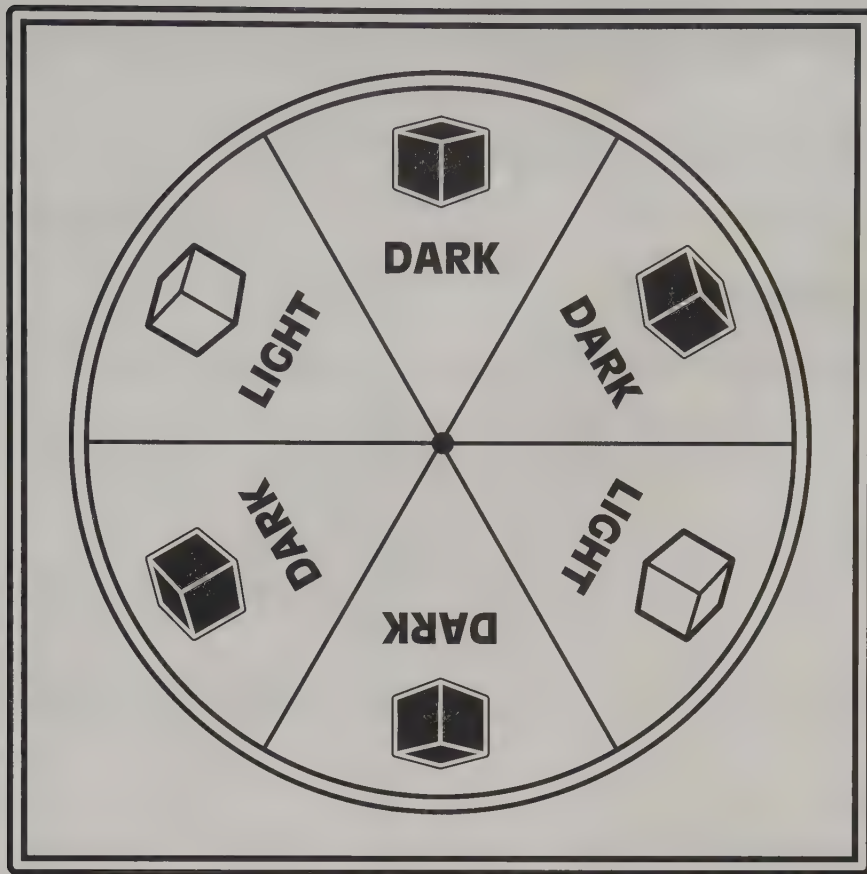
How would you find the average number of dark cubes?



YOU'LL NEED:

the *Color Chooser* and about ten light and fifteen dark cubes.

Color Chooser

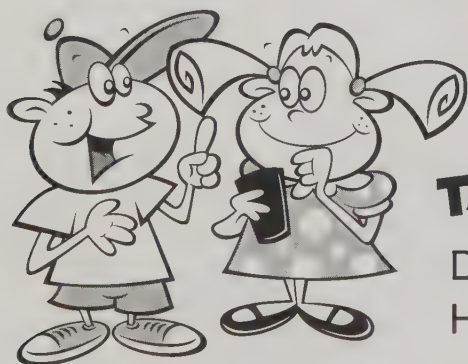


Who Is Closer

Do you improve with practice?

WORK TOGETHER!

- Find a large book with many pages, such as a dictionary.
- Find out how many pages are in the book to find your range of numbers.
- Pick a target page number for your partner and record it.
- Have your partner choose a target page for you.
- Without flipping the pages, try to open the book to the target page.
- Record the page number on the chart.
- Use your calculator to find how close you came to the page.



TALK ABOUT IT!

Did you improve with practice?
How do you know?

WHAT IF?

Would you expect to see the same pattern in your data if you were to play the game again?



YOU'LL NEED:

a large book and the *Data Charts* worksheet.

Data Charts

MY DATA

Turn	Target Page	Page Opened	Difference
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

PARTNER'S DATA

Turn	Target Page	Page Opened	Difference
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

How Many Spaces?

About how many spaces for a last name should be on a school form?

Name:

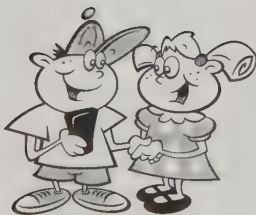
--	--	--	--	--	--	--	--	--	--	--	--	--	--

--

Last Name First Initial

Number of Letters	Tally	Total
3		
4		
5		
6		
7		
8		

WORK TOGETHER!

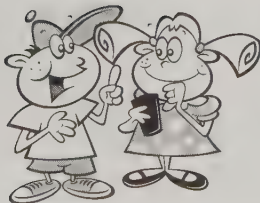


- Count the letters in your last name.
- Record the number on the class chart with a tally mark.
- When the tally column is complete, fill in the total column.



WRITE ABOUT IT!

What is the average number of last name letters in your class?



TALK ABOUT IT!

How would you answer the name space problem?
Did you use an average? Why or why not?

How Close?

Can you estimate when one minute is up?



WORK TOGETHER!

- As a class, close your eyes when your teacher says, "Now!" Open them when you think one minute is up.
- Write down the last number the teacher has written on the overhead that tells, to the nearest five seconds, how long your eyes were closed.
- As your teacher directs, fill in the tally column on the class chart.
- When the tally column is complete, fill in the total column.

WRITE ABOUT IT!

On the average, how long did the class keep their eyes closed? Use your calculator.



TALK ABOUT IT!

How close to one minute was the class average? Would you expect estimates to improve if the experiment was repeated? Try it!

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_____ Teacher

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Primary Calculator

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- Measurement
- Data and Chance

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- LER 0036 Intermediate Calc-U-Vue® Overhead Calculator
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- LER 0040 Scientific Calc-U-Vue® Overhead Calculator